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DETERMINATION OF PCB AND PCT IN THE ATMOSPHERE USING FILTER PAPER

Toshiichi Okita, Yukio Takizawa, Koei Minagawa, Ryuichi Sugai and Ikuei Kifune*

In order to perform simultaneous measurements of PCT and PCB produced by burning using a simple and rapid method, we studied the method of collecting them by glass fiber filter paper coated with glycerine. We also carried out measurements of those chemicals in the environment.

METHOD

We first added KC-C and KC-400 to glass filter papers coated with 10% and 20% glycerine, respectively, and then determined the recovery rate from these filter papers. The quantitative analysis of PCT and PCB contained in these filter papers was done by alkali decomposition, n-hexane extraction, and florigil chromatography (florigil-5g; solvent-150 ml), and also using the gas chromatograph attached to the ECD detector. The GC column is 2% OV-1, 1.5 m; the column temperature is 250° C for PCT and 180° C for PCB. Next, we heated KC-C, and KC-400 using the Mylerback device, constantly sending air to it and trapped KC-C and K-400 in gas phase and the tiny particles formed by the filter holders equipped with glycerine-coated glass filter paper of 4.7 am diameter and connected in series. We determined the trapping rate by observing the variation of the flow amount.

RESULTS AND DISCUSSIONS

(1) Separation of KC-C and KC-400 from the filter paper: As is seen for Table 1, both of them showed a separation rate of almost 100%.

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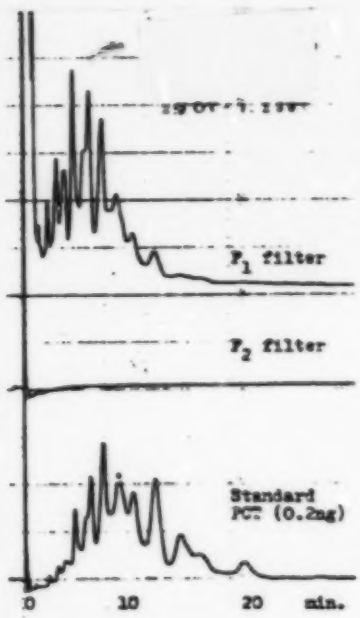

Figure 1. Gas chromatograms of the trapping filters (F_1, F_2) and the standard PCT.

(2) Trapping: Trapping of PCT is thoroughly done by the first filter paper (F_1) shown in Figure 1. It was not detected at all from the second filter paper (F_2). Also, as shown in the gas chromatogram, relatively more K-C which had lower boiling point components was detected (cℓ number 7 ∿ 12). This is probably because when KC-C was heated in the mylerback device at a temperature of about 250° C and air was introduced, the components whose cℓ numbers are 7 ∿ 12 become volatile.

Table 2 shows the trapping rate of KC-C and KC-400 at various glycerine concentrations on the filter paper and also at various flow rates for trapping gas. Either of them showed a trapping rate of nearly 100% at a glycerine concentration of 10% and a flow rate of 4 ℓ/min. Also, the trapping rate (E) was determined from

$$E = \frac{F_1 F_2}{F_1}$$

The small amount of PCB detected at F_2 is the component of PCB whose cℓ number is 1 ∿ 2 with a low boiling point. From the above-mentioned study, we conclude that if we use a filter paper sampler 8 inches x 10 inches in area, PCB and PCT (in the atmosphere) are almost 100% trapped at a flow rate of more than 100 ℓ/min.

(3) Measurements in the environment: The results are shown in Table 3.

TABLE 1. SEPARATION OF KC-C AND KC-400 FROM THE FILTER.

	The added amount	The re-covered amount	The rate of separation (%)
KC-C	20	19	95
	100	98	98
KC-400	1.0	0.98	98
	2.0	1.9	95
	5.0	4.8	96
	100	104	104

Table 2. TRAPPING RATE OF KC-C and KC-400

	Concentration of glycerine %	Flor rate ℓ/min.	Amt of PBC adher. to filter F_1 (mg)	F_2 (mg)	Trapping rate
KC-C	10	2	188	0.0	100
		4	190	0.0	100
KC-400	20	1	22	0.5	98
		2	20	1.4	97
	10	2	89	0.8	96
		4	164	5.1	96

TABLE 3. ACTUAL EXAMPLE OF PCB CONTAINED IN ATMOSPHERE

Sampling Site		PCB ng/m^3	PCB pattern
Carbon paper Storehouse	A	0.15	KC - 200
	B	0.10	"
Urban atmosphere	A	ND	-
	B	ND	-
Industrial area		0.04	KC-200,300 (1:1)

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Dear Mrs. Smith:

We received your request on the translation of our journal, the "Taiki Osen Kenkyu". We are glad to express our permission of the translation without any limitation.

Sincerely yours,

Toshiichi Okita

Toshiichi Okita Dr. Sc.
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